

PATENT ABSTRACTS OF JAPAN

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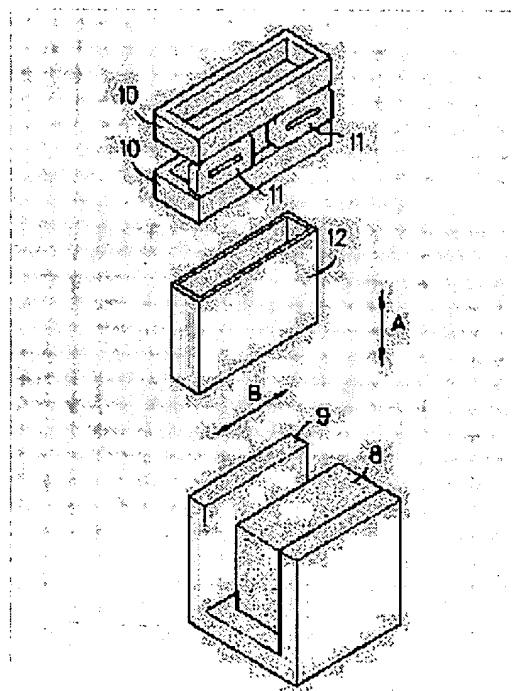
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(54) OBJECT-LENS DRIVING GEAR

(57)Abstract:

PURPOSE: To obtain an object-lens driving gear wherein its frequency characteristic is stable, it can be controlled with high accuracy and a signal can be replayed and recorded accurately by solving a trouble that the rigidity of a part around each shaft is weak and a subresonance is easy to cause in a constitution wherein the movable member of the object-lens driving gear is supported by a plurality of elastic support members.

CONSTITUTION: Focusing coils 10 are bonded and fixed to both upper and lower end parts of a bobbin 12, tracking coils 11 are bonded and fixed to the central part of the bobbin 12 in a position sandwiched between the focusing coils 10, and they are situated in the magnetic field of a yoke 9 to which a permanent magnet 8 has been bonded and fixed. When an electric current is made to flow to both coils 10, 11, the central point of a driving force generated in a focusing direction and a tracking direction can be made to coincide with the point of the center of gravity of a movable part by an above-mentioned constitution, and it is possible to obtain an object-lens driving gear in which a moment force exciting a subresonance is not generated, which eliminates the subresonance and whose frequency characteristic is good.



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CLAIMS

[Claim(s)]

[Claim 1] The moving-part material holding an objective lens, and the elastic member to which the other end is fixed to a holddown member by said moving-part material, respectively, and one end becomes it from two or more, The optical axis which passes said objective lens, and the 1st coil made to drive in this direction, The 2nd coil in the arrangement inserted relatively [make it drive in said optical axis and direct direction and / coil / said / 1st], The objective lens driving gear characterized by making in agreement the central point of the driving force which arranges said 1st and 2nd coils in a single magnetic-flux gap, and is generated in the direction of a focus, and the direction of tracking, and the center-of-gravity point of moving part.

[Claim 2] The moving-part material holding an objective lens, and the elastic member to which the other end is fixed to a holddown member by said moving-part material, respectively, and one end becomes it from two or more, The optical axis which passes said objective lens, and the 1st coil made to drive in the direct direction, The 2nd coil in the arrangement inserted relatively [make it drive in said optical axis and this direction and / coil / said / 1st], The objective lens driving gear characterized by making in agreement the central point of the driving force which arranges said 1st and 2nd coils in a single magnetic-flux gap, and is generated in the direction of a focus, and the direction of tracking, and the center-of-gravity point of moving part.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention projects an optical spot on an optical disk record medium through an objective lens, and relates to the objective lens driving gear which uses information for the optical disk unit recorded and reproduced optically.

[0002]

[Description of the Prior Art] In recent years, the objective lens driving gear is used for the objective lens drive of the optical pickup used as central components of sound, the object for image reproduction, and the external optical recording equipment for computers, and is accomplishing technical development by obtaining the engine performance stabilized under the miniaturization and the broad environment.

[0003] Below, it explains, referring to a drawing about the conventional objective lens driving gear. The top view and drawing 13 which show the whole objective lens driving gear of the former [drawing 12] are [the plan of drawing 13 and drawing 15 of the strabismus exploded view of the drive system of an objective lens driving gear part and drawing 14] the sectional side elevations of drawing 14. The objective lens with which 1 makes the recording surface of an optical disk condense an optical spot in drawing 12, The objective lens attachment component to which 2 is fixing said objective lens 1 with the binder etc., Two substrates which 3 has fixed on both sides of said objective lens attachment component 2, the holddown member in which 4 established four holes, The gel elastic member to which four holes of said holddown member 4 are made to carry out impregnation posture of 5, The base substrate with which 6 is being fixed to said holddown member 4 by adhesion etc., four metal wires which soldering immobilization is carried out, and 7 carries out the cantilevered suspension of said objective lens attachment component 2 to said substrate 3 and said base substrate 6, and are located in parallel, respectively, York where 8 is fixed with a permanent magnet and 9 is fixing said permanent magnet 8 by adhesion, the focal coil which 10 is fixed to said objective lens attachment component 2 by adhesion, and is carrying out soldering of the end-winding tail to said substrate 3, 11 is a tracking coil which is fixed to said focal coil 10 by adhesion, and is carrying out soldering of the coil end-of-line tail to said substrate 3.

[0004] The actuation is explained about the objective lens driving gear constituted as mentioned above. The tracking coil 11 which the focal coil 10 which makes said objective lens attachment component 2 which is moving part drive it in the direction of a focus in order to make the variation rate of the objective lens attachment component 2 holding the objective lens 1 shown in drawing 12 carry out in the direction of a focus (arrow head A) and the direction of tracking (arrow head B) as shown in drawing 13 is attached [coil], and makes it drive in the direction of tracking has fixed by adhesion in said focal coil 10.

[0005] Moreover, the permanent magnet 8 has fixed on the wall surface of York 9 where the cross section shown in drawing 13 carried out the configuration of a KO mold, and said focal coil 10 and said tracking coil 11 are arranged in the opening in the magnetic circuit built with said York 9 and said permanent magnet 8 as shown in drawing 14 and drawing 15. And the driving force by the

electromagnetic force produced according to the left-hand rule of Fleming according to the current to which each coil 10 and 11 flows in the direction which intersects perpendicularly to a field occurs. [0006] Moreover, consideration of the load rate for which it asks from assembly-operation nature or moving-part mass of said metal wire 7 shown in drawing 12 uses many wire rods of a circle configuration for the cross section with the next door bronze of about 0.1 to 0.2 wire size etc. And while supporting said objective lens attachment component 2 by the cantilever, it uses also as a feeder of the energization to said focal coil 10 and said tracking coil 11.

[0007]

[Problem(s) to be Solved by the Invention] However, although the configuration of the above-mentioned former shows the physical relationship of the central point of the driving force generated in the direction of a focus (arrow head A) and the direction of tracking (arrow head B) in an objective lens driving gear, and the center-of-gravity point of moving part to drawing 14 If c points which are a points which are the central point of the driving force of a focus and tracking, b points, and a center-of-gravity point of the moving part which sets up at the time of a design are not in agreement on a principle, the moment force will occur, and the subresonance which is easy to generate is excited according to the moment force of the circumference of driving force, the amount of gaps of a center of gravity, and each shaft. And it resonated, when the driving signal of the specific frequency which said subresonance generates entered, and the optical axis of an objective lens inclined, aberration occurred, and it had the trouble that the phenomenon which causes trouble to signal regeneration and record happened.

[0008] The central point where this invention solves the above-mentioned conventional trouble, and a focal coil and a tracking coil generate driving force, Consider the center-of-gravity point of moving part as a configuration in agreement, and generating of the moment force of generating subresonance is lost on a principle. Moving part can drive only in the desired direction of two dimension, frequency characteristics good [without generating the inclination of an objective lens] are acquired, and it aims at offering an objective lens driving gear with few unnecessary subresonance mode (pitching mode yawing mode etc.) phenomena.

[0009]

[Means for Solving the Problem] In order to attain this purpose, the objective lens driving gear of this invention has the arrangement configuration of the focal coil in which coincidence of the central point of the driving force generated in the direction of a focus and the direction of tracking and the center-of-gravity point of moving part is possible, and a tracking coil.

[0010]

[Function] The frequency characteristics stabilized by the above-mentioned configuration can be acquired, and this invention can double a focus with the recording surface of a disk for an optical spot correctly, and can follow a truck correctly.

[0011]

[Example]

(Example 1) Each example of this invention is explained below, referring to a drawing. The top view and drawing 2 which show the whole objective lens driving gear [in / in drawing 1 / the 1st example of this invention] are [the plan of drawing 2 and drawing 4 of the strabismus exploded view of the drive system of an objective lens driving gear part and drawing 3] the sectional side elevations of drawing 3 . Moreover, about the same configuration as the conventional objective lens driving gear shown in said drawing 12 thru/or drawing 15, the explanation is omitted using the same sign. In drawing 1, 12 is the bobbin of an insulating material, on this bobbin 12, fixes by adhesion in the location inserted into said focal coil 10 into the focal coil 10 which fixes by adhesion to a part for bottom both ends, and is carrying out soldering of the end-winding tail to the substrate 3, and the central part of said bobbin 12, and consists of tracking coils 11 which are carrying out soldering of the coil end-of-line tail to said substrate 3.

[0012] The driving means of the direction of a focus (arrow head A) shown in drawing 2 generates a powerful field between the fields of York 9 which consisted of the magnetic substance, such as iron, and York 9 which has met with the permanent magnet 8. In this condition, the focal coil 10 is arranged in

said field, as shown in drawing 3 and drawing 4, and it generates the electromagnetic force which drives moving part in the perpendicular direction of a focus, i.e., the direction, (arrow head A) to the recording surface of a disk according to the left-hand rule of Fleming by energizing in said focal coil 10.

[0013] Moreover, by energizing in the tracking coil 11 arranged like drawing 2 in the same field which generates the driving force of said direction of a focus, since the driving means of the direction of tracking (arrow head B) shown in drawing 2 follows the pit of a disk, it generates the electromagnetic force which drives moving part in the longitudinal direction of tracking, i.e., the direction, (arrow head B).

[0014] Although the physical relationship of the central point of the driving force generated in the direction of a focus and the direction of tracking in an objective lens driving gear of this example and the center-of-gravity point of moving part is shown in the plan of drawing 3 If the center-of-gravity point of the whole moving part which decides d points and the central point of the driving force of the direction of tracking for the central point of the driving force of the direction of a focus at the time of e points and a design is made into f points f points which are center-of-gravity points of the moving part which sets up by drawing 3 at d points which are the central point of the driving force of a focus and tracking, e points, and the time of a design so that clearly can be made in agreement. Generating of the moment force in which this generates subresonance is lost, it can drive only in the desired direction of two dimension, frequency characteristics good [without generating the inclination of an objective lens] are acquired, and moving part can suppress an unnecessary subresonance mode phenomenon. That is, stable frequency characteristics are acquired, and a focus is correctly doubled with the recording surface of a disk for an optical spot, and a truck can be followed correctly.

[0015] (Example 2) The top view and drawing 6 which show the whole objective lens driving gear [in / in drawing 5 / the 2nd example of this invention] are [the plan of drawing 6 and drawing 8 of the strabismus exploded view of the drive system of an objective lens driving gear part and drawing 7] the sectional side elevations of drawing 7. In drawing 5, the same sign is attached about the same thing as the configuration of said drawing 1 (example 1), and the explanation is omitted. Differing from drawing 1 is a point which the focal coil 10 has fixed by adhesion in the location where the central part of a bobbin 12 and the tracking coil 11 insert said focal coil 10 in the bottom upwards in a drawing, as shown in drawing 6 or drawing 8.

[0016] As mentioned above, also by replacing the location of the tracking coil 11 to the focal coil 10 of an example 1, respectively, the configuration which is in agreement in the location shown in g points of drawing 7 in the point of the tracking coil 11 generating [driving force] and the center-of-gravity point of moving part is attained, there is no generating of the subresonance which generates the inclination of an objective lens, and good frequency characteristics are acquired.

[0017] (Example 3) Drawing 9 is the top view showing the whole objective lens driving gear in the 3rd example of this invention. In drawing 9, the same sign is attached about the same thing as the configuration of said drawing 1 (example 1), and the explanation is omitted. Although it is the physical relationship which inserts the tracking coil 11 from the both sides of the focal coil 10 in the perpendicular direction of a focus, i.e., the direction, to a disk in the example 1, in the example 3, the physical relationship by which the focal coil 10 inserts the tracking coil 11 in the direction of tracking differs from the example 1 of drawing 1. It is the point which has fixed by adhesion in the location which inserts the tracking coil 11 in the central part between the 1st focal coil 10-1 and the 2nd focal coil 10-2.

[0018] The actuation about the objective lens driving gear constituted as mentioned above can be in agreement in the central point of driving force and the center-of-gravity point of moving part which are generated in a focus and the direction of tracking as well as an example 1.

[0019] (Example 4) Drawing 10 is the top view showing the whole objective lens driving gear in the 4th example of this invention. In drawing 10, it is the same as that of the configuration of said drawing 9 (example 3). Differing from an example 3 (drawing 9) is a point which has fixed both the coils of the 1st focal coil 10-1 and the tracking coil 11 by adhesion by the physical relationship which the 2nd focal coil 10-2 surrounds in the example 4.

[0020] The actuation about the objective lens driving gear constituted as mentioned above can be in agreement in the central point of driving force and the center-of-gravity point of moving part which are generated in the direction of a focus, and the direction of tracking as well as an example 3.

[0021] In addition, in the above-mentioned 1st thru/or the 4th above-mentioned example, although the cross section of the metal wire 7 which is supporter material is a circle configuration and is turnable in any direction, things, such as an ellipse, a square, and a rectangle, can also be used for a cross section. Moreover, although said metal wire which is supporter material is arranged to parallel in the example, respectively, as shown in the top view of the 5th example of drawing 11, also suppose that it is unparallel. Moreover, although gel is enclosed with the fixed part side of the metal wire of supporter material and resonance of said metal wire is lessened according to a damping operation in the example, it cannot be overemphasized that wrap supporter material is also effective in a metal wire by a butyl system rubber tube with the damping operation with a bigger hole than the path of said metal wire etc.

[0022]

[Effect of the Invention] As explained above, the objective lens driving gear of this invention is can be in agreement in the central point of the driving force generated in the direction of a focus, and the direction of tracking by the very easy configuration, and the center-of-gravity point of moving part, and an objective lens driving gear with a high precision which can drive moving part can be realized, without inducing subresonance.

[Translation done.]

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TECHNICAL FIELD

[Industrial Application] This invention projects an optical spot on an optical disk record medium through an objective lens, and relates to the objective lens driving gear which uses information for the optical disk unit recorded and reproduced optically.

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PRIOR ART

[Description of the Prior Art] In recent years, the objective lens driving gear is used for the objective lens drive of the optical pickup used as central components of sound, the object for image reproduction, and the external optical recording equipment for computers, and is accomplishing technical development by obtaining the engine performance stabilized under the miniaturization and the broad environment.

[0003] Below, it explains, referring to a drawing about the conventional objective lens driving gear. The top view and drawing 13 which show the whole objective lens driving gear of the former [drawing 12] are [the plan of drawing 13 and drawing 15 of the strabismus exploded view of the drive system of an objective lens driving gear part and drawing 14] the sectional side elevations of drawing 14. Set to drawing 12. The objective lens with which 1 makes the recording surface of an optical disk condense an optical spot, the objective lens attachment component to which 2 is fixing said objective lens 1 with the binder etc., Two substrates which 3 has fixed on both sides of said objective lens attachment component 2, the holddown member in which 4 established four holes, The gel elastic member to which four holes of said holddown member 4 are made to carry out impregnation posture of 5, The base substrate with which 6 is being fixed to said holddown member 4 by adhesion etc., four metal wires which soldering immobilization is carried out, and 7 carries out the cantilevered suspension of said objective lens attachment component 2 to said substrate 3 and said base substrate 6, and are located in parallel, respectively, York where 8 is fixed with a permanent magnet and 9 is fixing said permanent magnet 8 by adhesion, the focal coil which 10 is fixed to said objective lens attachment component 2 by adhesion, and is carrying out soldering of the end-winding tail to said substrate 3, 11 is a tracking coil which is fixed to said focal coil 10 by adhesion, and is carrying out soldering of the coil end-of-line tail to said substrate 3.

[0004] The actuation is explained about the objective lens driving gear constituted as mentioned above. The tracking coil 11 which the focal coil 10 which makes said objective lens attachment component 2 which is moving part drive it in the direction of a focus in order to make the variation rate of the objective lens attachment component 2 holding the objective lens 1 shown in drawing 12 carry out in the direction of a focus (arrow head A) and the direction of tracking (arrow head B) as shown in drawing 13 is attached [coil], and makes it drive in the direction of tracking has fixed by adhesion in said focal coil 10.

[0005] Moreover, the permanent magnet 8 has fixed on the wall surface of York 9 where the cross section shown in drawing 13 carried out the configuration of a KO mold, and said focal coil 10 and said tracking coil 11 are arranged in the opening in the magnetic circuit built with said York 9 and said permanent magnet 8 as shown in drawing 14 and drawing 15. And the driving force by the electromagnetic force produced according to the left-hand rule of Fleming according to the current to which each coil 10 and 11 flows in the direction which intersects perpendicularly to a field occurs.

[0006] Moreover, consideration of the load rate for which it asks from assembly-operation nature or moving-part mass of said metal wire 7 shown in drawing 12 uses many wire rods of a circle configuration for the cross section with the next door bronze of about 0.1 to 0.2 wire size etc. And while supporting said objective lens attachment component 2 by the cantilever, it uses also as a feeder of the

energization to said focal coil 10 and said tracking coil 11.

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EFFECT OF THE INVENTION

[Effect of the Invention] As explained above, the objective lens driving gear of this invention is can be in agreement in the central point of the driving force generated in the direction of a focus, and the direction of tracking by the very easy configuration, and the center-of-gravity point of moving part, and an objective lens driving gear with a high precision which can drive moving part can be realized, without inducing subresonance.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, although the configuration of the above-mentioned former shows the physical relationship of the central point of the driving force generated in the direction of a focus (arrow head A) and the direction of tracking (arrow head B) in an objective lens driving gear, and the center-of-gravity point of moving part to drawing 14 If c points which are a points which are the central point of the driving force of a focus and tracking, b points, and a center-of-gravity point of the moving part which sets up at the time of a design are not in agreement on a principle, the moment force will occur, and the subresonance which is easy to generate is excited according to the moment force of the circumference of driving force, the amount of gaps of a center of gravity, and each shaft. And it resonated, when the driving signal of the specific frequency which said subresonance generates entered, and the optical axis of an objective lens inclined, aberration occurred, and it had the trouble that the phenomenon which causes trouble to signal regeneration and record happened.

[0008] The central point where this invention solves the above-mentioned conventional trouble, and a focal coil and a tracking coil generate driving force, Consider the center-of-gravity point of moving part as a configuration in agreement, and generating of the moment force of generating subresonance is lost on a principle. Moving part can drive only in the desired direction of two dimension, frequency characteristics good [without generating the inclination of an objective lens] are acquired, and it aims at offering an objective lens driving gear with few unnecessary subresonance mode (pitching mode yawing mode etc.) phenomena.

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MEANS

[Means for Solving the Problem] In order to attain this purpose, the objective lens driving gear of this invention has the arrangement configuration of the focal coil in which coincidence of the central point of the driving force generated in the direction of a focus and the direction of tracking and the center-of-gravity point of moving part is possible, and a tracking coil.

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OPERATION

[Function] The frequency characteristics stabilized by the above-mentioned configuration can be acquired, and this invention can double a focus with the recording surface of a disk for an optical spot correctly, and can follow a truck correctly.

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EXAMPLE

[Example]

(Example 1) Each example of this invention is explained below, referring to a drawing. The top view and drawing 2 which show the whole objective lens driving gear [in / in drawing 1 / the 1st example of this invention] are [the plan of drawing 2 and drawing 4 of the strabismus exploded view of the drive system of an objective lens driving gear part and drawing 3] the sectional side elevations of drawing 3 . Moreover, about the same configuration as the conventional objective lens driving gear shown in said drawing 12 thru/or drawing 15, the explanation is omitted using the same sign. In drawing 1, 12 is the bobbin of an insulating material, on this bobbin 12, fixes by adhesion in the location inserted into said focal coil 10 into the focal coil 10 which fixes by adhesion to a part for bottom both ends, and is carrying out soldering of the end-winding tail to the substrate 3, and the central part of said bobbin 12, and consists of tracking coils 11 which are carrying out soldering of the coil end-of-line tail to said substrate 3.

[0012] The driving means of the direction of a focus (arrow head A) shown in drawing 2 generates a powerful field between the fields of York 9 which consisted of the magnetic substance, such as iron, and York 9 which has met with the permanent magnet 8. In this condition, the focal coil 10 is arranged in said field, as shown in drawing 3 and drawing 4 , and it generates the electromagnetic force which drives moving part in the perpendicular direction of a focus, i.e., the direction, (arrow head A) to the recording surface of a disk according to the left-hand rule of Fleming by energizing in said focal coil 10.

[0013] Moreover, by energizing in the tracking coil 11 arranged like drawing 2 in the same field which generates the driving force of said direction of a focus, since the driving means of the direction of tracking (arrow head B) shown in drawing 2 follows the pit of a disk, it generates the electromagnetic force which drives moving part in the longitudinal direction of tracking, i.e., the direction, (arrow head B).

[0014] Although the physical relationship of the central point of the driving force generated in the direction of a focus and the direction of tracking in an objective lens driving gear of this example and the center-of-gravity point of moving part is shown in the plan of drawing 3 If the center-of-gravity point of the whole moving part which decides d points and the central point of the driving force of the direction of tracking for the central point of the driving force of the direction of a focus at the time of e points and a design is made into f points f points which are center-of-gravity points of the moving part which sets up by drawing 3 at d points which are the central point of the driving force of a focus and tracking, e points, and the time of a design so that clearly can be made in agreement. Generating of the moment force in which this generates subresonance is lost, it can drive only in the desired direction of two dimension, frequency characteristics good [without generating the inclination of an objective lens] are acquired, and moving part can suppress an unnecessary subresonance mode phenomenon. That is, stable frequency characteristics are acquired, and a focus is correctly doubled with the recording surface of a disk for an optical spot, and a truck can be followed correctly.

[0015] (Example 2) The top view and drawing 6 which show the whole objective lens driving gear [in / in drawing 5 / the 2nd example of this invention] are [the plan of drawing 6 and drawing 8 of the

strabismus exploded view of the drive system of an objective lens driving gear part and drawing 7] the sectional side elevations of drawing 7 . In drawing 5 , the same sign is attached about the same thing as the configuration of said drawing 1 (example 1), and the explanation is omitted. Differing from drawing 1 is a point which the focal coil 10 has fixed by adhesion in the location where the central part of a bobbin 12 and the tracking coil 11 insert said focal coil 10 in the bottom upwards in a drawing, as shown in drawing 6 or drawing 8 .

[0016] As mentioned above, also by replacing the location of the tracking coil 11 to the focal coil 10 of an example 1, respectively, the configuration which is in agreement in the location shown in g points of drawing 7 in the point of the tracking coil 11 generating [driving force] and the center-of-gravity point of moving part is attained, there is no generating of the subresonance which generates the inclination of an objective lens, and good frequency characteristics are acquired.

[0017] (Example 3) Drawing 9 is the top view showing the whole objective lens driving gear in the 3rd example of this invention. In drawing 9 , the same sign is attached about the same thing as the configuration of said drawing 1 (example 1), and the explanation is omitted. Although it is the physical relationship which inserts the tracking coil 11 from the both sides of the focal coil 10 in the perpendicular direction of a focus, i.e., the direction, to a disk in the example 1, in the example 3, the physical relationship by which the focal coil 10 inserts the tracking coil 11 in the direction of tracking differs from the example 1 of drawing 1 . It is the point which has fixed by adhesion in the location which inserts the tracking coil 11 in the central part between the 1st focal coil 10-1 and the 2nd focal coil 10-2.

[0018] The actuation about the objective lens driving gear constituted as mentioned above can be in agreement in the central point of driving force and the center-of-gravity point of moving part which are generated in a focus and the direction of tracking as well as an example 1.

[0019] (Example 4) Drawing 10 is the top view showing the whole objective lens driving gear in the 4th example of this invention. In drawing 10, it is the same as that of the configuration of said drawing 9 (example 3). Differing from an example 3 (drawing 9) is a point which has fixed both the coils of the 1st focal coil 10-1 and the tracking coil 11 by adhesion by the physical relationship which the 2nd focal coil 10-2 surrounds in the example 4.

[0020] The actuation about the objective lens driving gear constituted as mentioned above can be in agreement in the central point of driving force and the center-of-gravity point of moving part which are generated in the direction of a focus, and the direction of tracking as well as an example 3.

[0021] In addition, in the above-mentioned 1st thru/or the 4th above-mentioned example, although the cross section of the metal wire 7 which is supporter material is a circle configuration and is turnable in any direction, things, such as an ellipse, a square, and a rectangle, can also be used for a cross section. Moreover, although said metal wire which is supporter material is arranged to parallel in the example, respectively, as shown in the top view of the 5th example of drawing 11, also suppose that it is unparallel. Moreover, although gel is enclosed with the fixed part side of the metal wire of supporter material and resonance of said metal wire is lessened according to a damping operation in the example, it cannot be overemphasized that wrap supporter material is also effective in a metal wire by a butyl system rubber tube with the damping operation with a bigger hole than the path of said metal wire etc.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the top view showing the whole objective lens driving gear in the 1st example of this invention.

[Drawing 2] It is the strabismus exploded view of the drive system of the objective lens driving gear of drawing 1 part.

[Drawing 3] It is the plan of the drive system of the objective lens driving gear of drawing 2 part.

[Drawing 4] It is the sectional side elevation of the drive system of the objective lens driving gear of drawing 3 part.

[Drawing 5] It is the top view showing the whole objective lens driving gear in the 2nd example of this invention.

[Drawing 6] It is the strabismus exploded view of the drive system of the objective lens driving gear of drawing 5 part.

[Drawing 7] It is the plan of the drive system of the objective lens driving gear of drawing 6 part.

[Drawing 8] It is the sectional side elevation of the drive system of the objective lens driving gear of drawing 7 part.

[Drawing 9] It is the top view showing the whole objective lens driving gear in the 3rd example of this invention.

[Drawing 10] It is the top view showing the whole objective lens driving gear in the 4th example of this invention.

[Drawing 11] It is the top view showing the whole objective lens driving gear in the 5th example of this invention.

[Drawing 12] It is the top view showing the conventional whole objective lens driving gear.

[Drawing 13] It is the strabismus exploded view of the drive system in the objective lens driving gear of drawing 12 part.

[Drawing 14] It is the plan of drawing 13.

[Drawing 15] It is the sectional view of drawing 14.

[Description of Notations]

1 -- Objective lens 2 -- Objective lens attachment component 3 -- Substrate 4 [6 -- Base substrate 7 -- Metal wire 8 -- Permanent magnet 9 -- York 10, 10-1 10-2 -- Focal coil 11 -- A tracking coil, 12 -- Bobbin.] -- A holddown member, 5 -- Gel elastic member

[Translation done.]

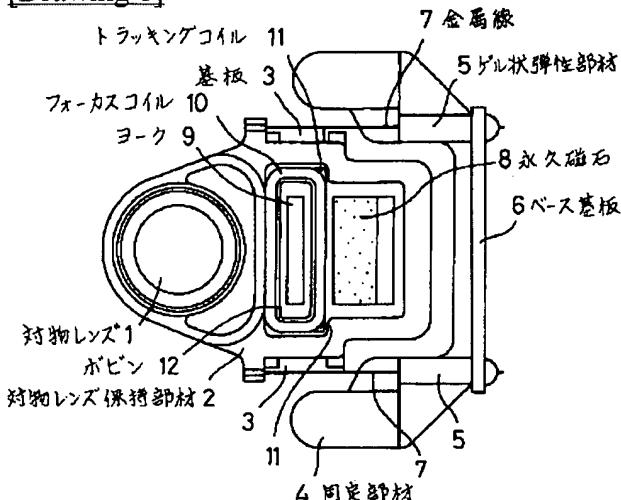
* NOTICES *

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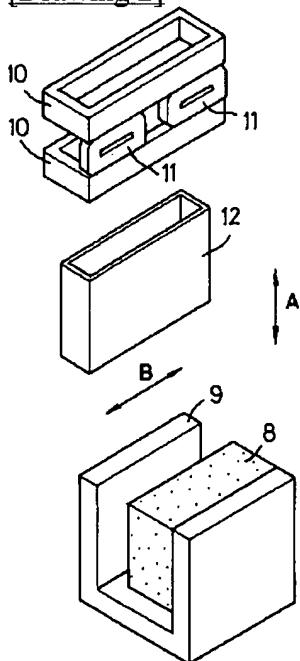
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

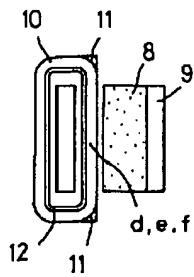
[Drawing 1]



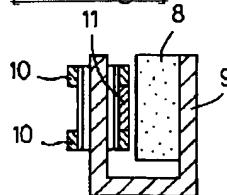
[Drawing 2]



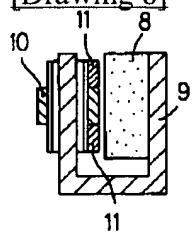
[Drawing 3]



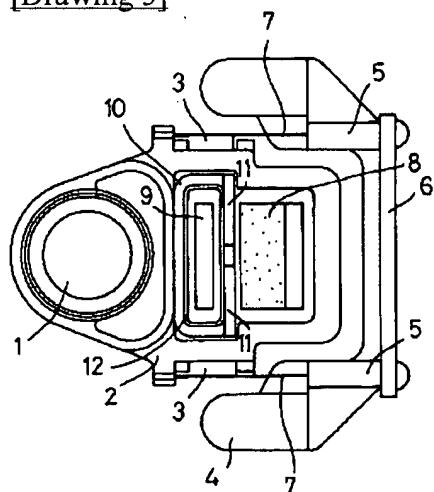
[Drawing 4]



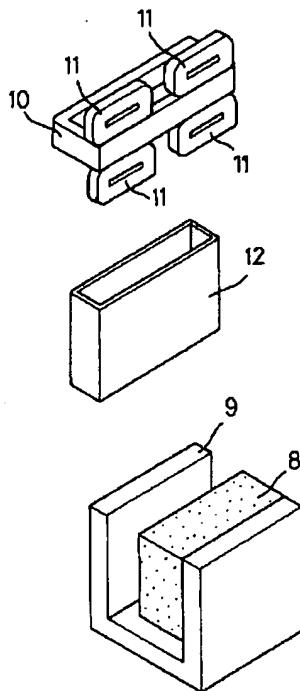
[Drawing 8]



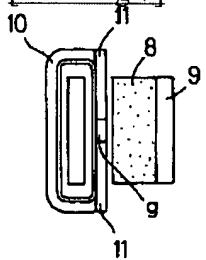
[Drawing 5]



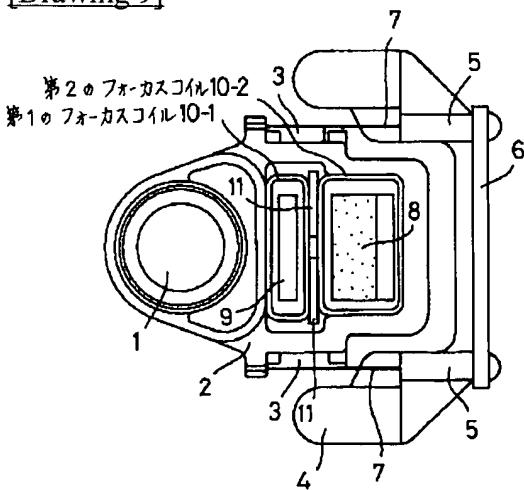
[Drawing 6]



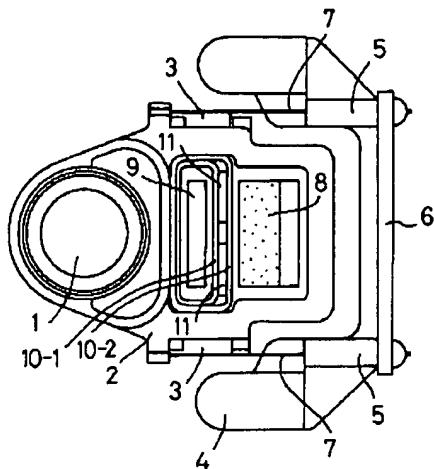
[Drawing 7]



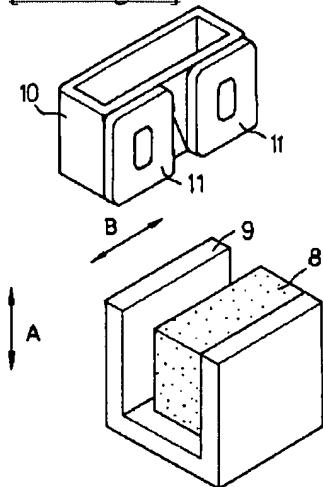
[Drawing 9]



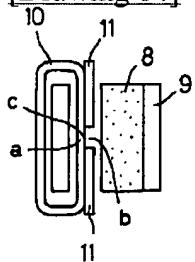
[Drawing 10]



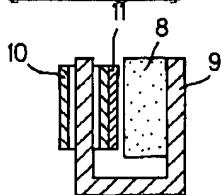
[Drawing 13]



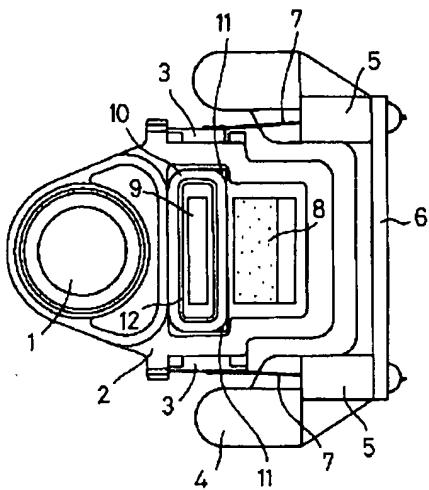
[Drawing 14]



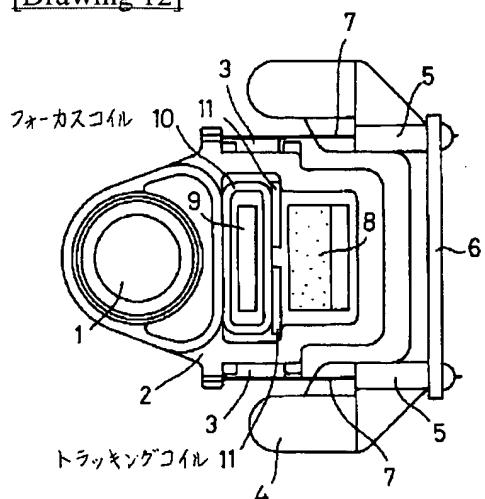
[Drawing 15]



[Drawing 11]



[Drawing 12]



[Translation done.]